# 3.1 Investigating Non-Linear Relationships

A. Lines and Curves of Best Fit
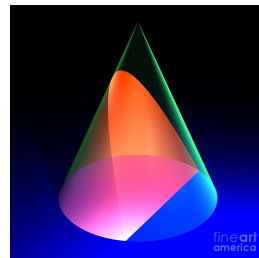
Line of Best Fit: a line drawn through a scatter plot when the data appears to follow a linear relation.

Curve of Best Fit: A smooth curve that represents the "shape" of the data. Non-linear data will have a curve of best fit.

Ex. 1 Determine whether the data represents a linear or non-linear relation, then draw the line or curve of best fit.
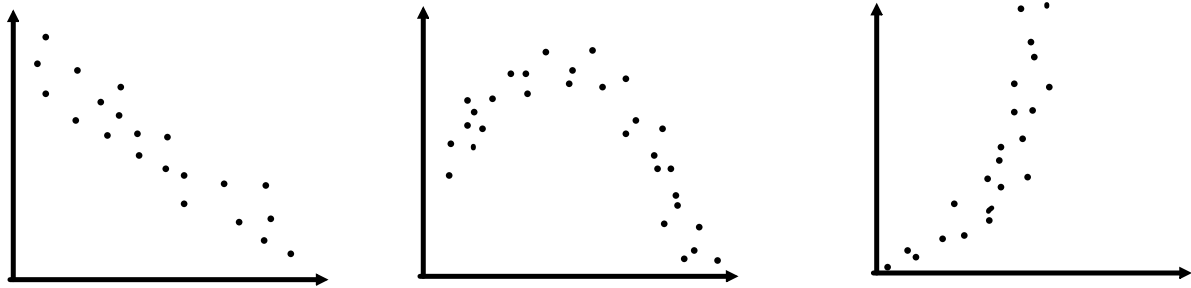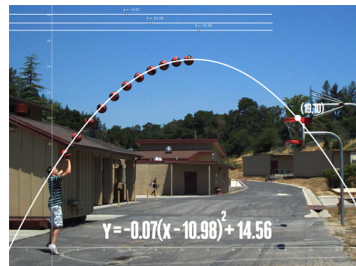

Bayonne Bridge, NY

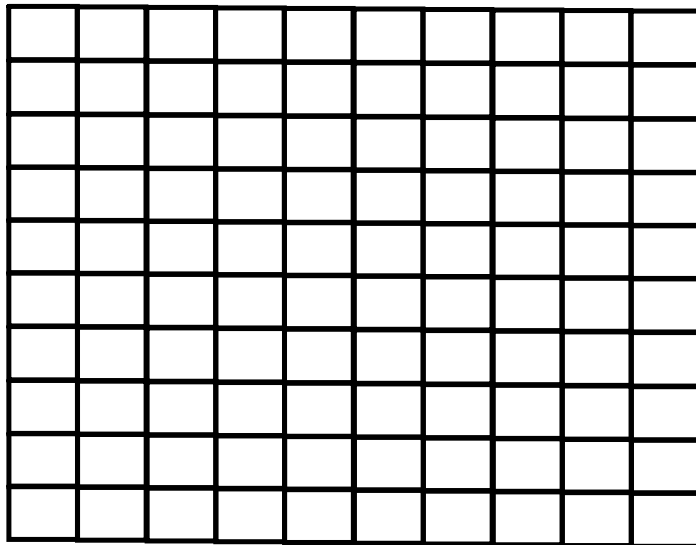Slice a cone at an angle

Parabolic reflectors

$$y = -0.07(x - 10.98)^2 + 14.56$$

Basketball

B. Scatter Plots

Ex. 2 A toy rocket is launched straight up. The table shows its height, h, in metres above the ground after t seconds.
a)   Create a scatter plot of the data.

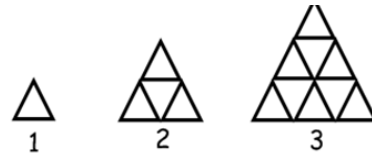| Time	Height
0	16
1	49
2	72
3	85
4	88
5	81
6	64

b)   Describe the relation.

c)   Draw a curve of best fit.

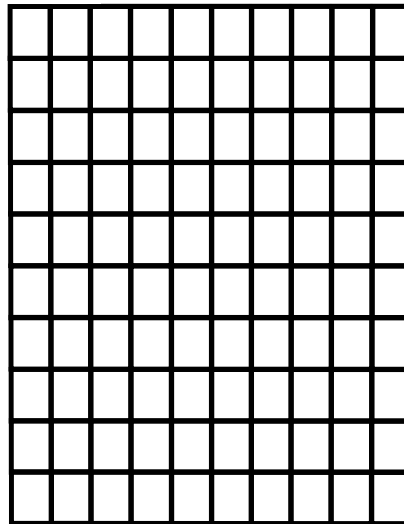d)   Use your model to predict the height of the rocket at 8 seconds.

e)   Describe how the graph would change if the rocket stayed in the air for 15 seconds.

Ex. 3 Toothpicks can be arranged to create equilateral triangles as shown.

a) Complete the table and create a scatter plot for the data.

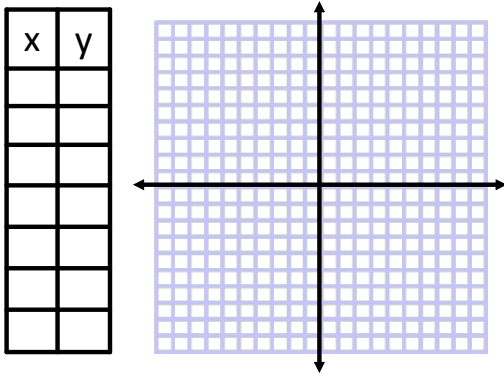| Side Length	Total # of Toothpicks
0	0
1	3
2	
3	
4	
5	

b) Describe the relation.

c) Draw a curve of best fit.

d) Use your model to predict the number of toothpicks needed to build a triangle with a side length of 6 toothpicks.
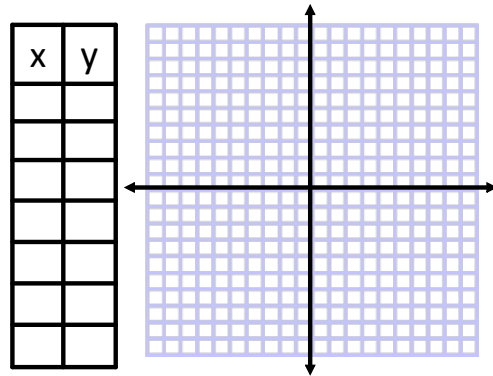
Graphs of Quadratic Relations

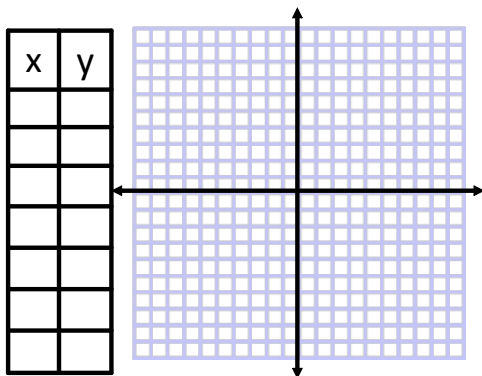Ex. 4 Complete the table of values and graph each relation.

a) $y = x^2$

x	y

b) $y = 5 - x^2$

x	y

c) $y = 2x^2 - 3x - 4$

x	y

Describe what these graphs have in common.

Ex. 5 Use graphing technology to graph each of the following.

a) $y = -2x^2 + x - 3$

b) $y = x^2 + 7x + 3$

c) $y = x^2 - 4x + 4$

Graph

These are the graphs of **QUADRATIC** relations.
The graph is called a **PARABOLA.**